m-L

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/822,561	04/08/2004	Jose De La Torre-Bueno	10225-038001	2608

20985 7590 01/24/2007
FISH & RICHARDSON, PC
P.O. BOX 1022
MINNEAPOLIS, MN 55440-1022

EXAMINER	
LAROSE, COLIN M	
ART UNIT	PAPER NUMBER
2624	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/24/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/822,561	DE LA TORRE-BUENO, JOSE	
	Examiner	Art Unit	
	Colin M. LaRose	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 October 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23* is/are pending in the application.

4a) Of the above claim(s) *19-21 and 23* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18 and 22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *6/28/2004, 11/8/2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of Group I (claims 1-18 and 22) in the reply filed on 27 October 2006 is acknowledged.

Claim Objections

2. Claims 7 and 16 objected to because it is unclear which "color channels" of claims 1 and 10 are being referenced since claims 1 and 10 each provide for "color channel values" in two different instances. Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-17 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 7,065,236 by Marcelpoil et al. ("Marcelpoil") in view of U.S. Patent 4,090,243 by Kotera et al. ("Kotera").

Regarding claims 1 and 10, Marcelpoil discloses a method/program for quantifying color in a sample comprising multiple colors, the method comprising:

measuring a color channel value in a plurality of pixels from a control sample comprising a single color of interest (column 8/14-23: camera 300 captures a color image of a sample 500 – the image having red, green, and blue color channel values);

defining a vector for the control sample, wherein the vector comprises a color channel value present in the control (e.g. the optical density vector OD, given by equations 3-5 or 6-8 in column 11, defines a vector comprising the measured optical densities for the red, green, and blue color channels);

defining a matrix comprising each of the values of each of the color channels (i.e. the matrix formed by the equations associated with the OD vector is defined by equations 21 and 22 in column 14, in order to determine the dye concentrations C based on the known optical densities OD and absorption coefficients ε – see column 14/1-6);

defining a conversion matrix comprising the inverse of the matrix based upon the control measurements (i.e. the conversion matrix denoted by equation 23 in column 14 is defined based upon the measured control optical densities);

measuring color channel values in an image of an experimental sample comprising a plurality of colors of interest, each of the pixels comprising a plurality of color channels (column 16/9-14: an experimental sample having the same dyes uses in the calibration process for determining the conversion matrix is imaged in the same manner as the control sample); and

calculating the amount of a color in the experimental sample by converting the channel values in the experimental sample using the conversion matrix (column 16/14-31: the amount of color, or concentrations of the dyes, in the experimental sample is determined using the conversion matrix).

However, Marcelpoil seems to only utilize a single control sample and does not appear to disclose or suggest using a "plurality of control samples," as claimed. Accordingly, Marcelpoil does not disclose defining the vector or the matrix on the basis of an "average" of color channel values for a "plurality of control samples."

Kotera discloses a system (figures 1A and 1B) for characterizing the colors of a color sample that is very similar to that of Marcelpoil and involves the same concepts of deriving an inverse matrix of mean color intensity values (column 5/1-35) and using the inverse matrix to ascertain the colors of an experimental sample (column 5/58-66). In particular, Kotera teaches that control color prints C1 ... Cn, as shown in figure 2, are imaged, and the measured colors and used to determine the conversion matrix. Kotera teaches that each of these control color prints contain a plurality of "elemental areas," which essentially correspond to sub-areas within the larger print area, and the elemental areas are each "microscopically" imaged to generate representative intensity signals thereof (column 1/59 through column 2/3). The mean intensity value μ of each spectral (i.e. color) component for each control color print corresponds to the representative intensity signal of a per-unit area (column 2/18-27). The set of mean values μ, in conjunction with the set of representative intensity signals, is utilized to obtain the conversion matrix that is used to ascertain the color C_i of a given experimental sample, expressed as the probability $P(C_i)$ that the ascertained color corresponds to the i-th control print (see column 2/22-39 and column 3/57 et seq.).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Marcelpoil by Kotera to achieve the claimed invention by measuring a plurality of

control samples and defining the vector and the matrix on the basis of an average of each color channel present in the control samples, since Kotera shows that it was conventional to microscopically scan a control color print on the basis of a plurality of "elemental" sample areas and utilize the average of those sample areas as a basis for deriving a conversion matrix, as explained above. Such a modification would achieve substantially the same results as achieved by Marcelpoil since Marcelpoil's control samples are analyzed in a region where two or three dyes are mixed to produce an area of uniform color.

Regarding claims 2 and 11, Marcelpoil discloses the color channels comprise red, green, and blue (see figure 1).

Regarding claims 3 and 12, the combination of Marcelpoil and Kotera discloses each control is stained with a single staining reagent to generate a color of interest (column 9/13-17 and column 10/63 et seq. of Marcelpoil: the control is stained with a plurality of staining reagents, including a single marker dye that is used to generate a color of interest).

Regarding claims 4 and 13, Marcelpoil discloses that the experimental sample is stained with a plurality of stains to generate a plurality of colors of interest (column 10/63 et seq.: the sample is stained with e.g. a marker dye and a counterstain).

Regarding claims 5 and 14, Marcelpoil discloses that the number of stains in a experimental sample are less than or equal to the number of color channels (column 16/14-31: concentrations of 3 dyes are determined – with there being 3 color channels).

Regarding claims 6 and 15, Marcelpoil suggests that an image of the experimental sample can be displayed as a monochrome image (see e.g. equation 24, column 16, which quantifies the black and white pixel intensities for the experimental sample image).

Regarding claims 7 and 16, Marcelpoil does not expressly disclose setting all but one of the color channels to zero in order to determine the amount of a single color in the experimental sample, as claimed, however, such a limitation would have been exceedingly well-known and obvious to those skilled in the art in view of the fact that each of the color channels for an RGB image independently quantify the amount of a single color – red, green, or blue – present in an image, and e.g. the values of red and green channels have no bearing on how much "blue" is exhibited by an image of the sample.

Regarding claims 8 and 17, Marcelpoil discloses rendering a digital display of the experimental sample (i.e. displayed on the computer screen, as shown in figures 1 and 2).

Regarding claim 9, the combination of Marcelpoil and Kotera teaches the computer implemented method of claim 1 (i.e. both Marcelpoil's and Kotera's methods are implemented via a computer).

Regarding claim 22, Marcelpoil discloses that the computer-implemented method can be automated (see column 20/2-14).

5. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 7,065,236 by Marcelpoil et al. ("Marcelpoil") in view of U.S. Patent 4,090,243 by Kotera et al. ("Kotera") and U.S. Patent Application Publication 2004/0114227 by Henderson et al. ("Henderson").

Regarding claim 18, Marcelpoil discloses a machine vision system (figures 1 and 2) for automated analysis of a biological sample on a slide comprising:

a system processor (i.e. computer 350 includes a processor);

a computer program on computer readable medium (column 20/2-14), the computer program comprising an image algorithm comprising instructions to cause the computer to:

measure a color channel value in a plurality of pixels from a control sample comprising a single color of interest (column 8/14-23: camera 300 captures a color image of a sample 500 – the image having red, green, and blue color channel values);

define a vector for the control sample, wherein the vector comprises a color channel value present in the control (e.g. the optical density vector OD, given by equations 3-5 or 6-8 in column 11, defines a vector comprising the measured optical densities for the red, green, and blue color channels);

define a matrix comprising each of the values of each of the color channels (i.e. the matrix formed by the equations associated with the OD vector is defined by equations 21 and 22 in column 14, in order to determine the dye concentrations C based on the known optical densities OD and absorption coefficients ε – see column 14/1-6);

define a conversion matrix comprising the inverse of the matrix based upon the control measurements (i.e. the conversion matrix denoted by equation 23 in column 14 is defined based upon the measured control optical densities);

measure color channel values in an image of an experimental sample comprising a plurality of colors of interest, each of the pixels comprising a plurality of color channels (column

16/9-14: an experimental sample having the same dyes uses in the calibration process for determining the conversion matrix is imaged in the same manner as the control sample); and

calculate the amount of a color in the experimental sample by converting the channel values in the experimental sample using the conversion matrix (column 16/14-31: the amount of color, or concentrations of the dyes, in the experimental sample is determined using the conversion matrix); and

output the amount of color in the experimental sample (column 17/1-19);

a monitor in operable communication with the computer (as shown in figure 1);

an input device in connection with the computer (e.g. keyboard or mouse shown in figure 2);

an optical imaging system (video microscopy system 100) in operable communication with the computer, comprising:

a movable stage (column 18/59-63);

an identification member (column 17/28-45: identification marks produced by an operator);

an optical sensing member (camera 300) in optical communication with the stage configured to acquire an image at a location on a slide and in electrical communication with the processor;

a storage member for storing the location of a candidate object or area of interest (column 17/20-64 and column 19/28-46: the memory of the computer 350 is used to store images containing markings that indicate the locations of areas of interest); and

a storage device for storing each image (column 19/22-32).

However, Marcelpoil seems to only utilize a single control sample and does not appear to disclose or suggest using a "plurality of control samples," as claimed. Accordingly, Marcelpoil does not disclose defining the vector or the matrix on the basis of an "average" of color channel values for a "plurality of control samples."

Kotera discloses a system (figures 1A and 1B) for characterizing the colors of a color sample that is very similar to that of Marcelpoil and involves the same concepts of deriving an inverse matrix of mean color intensity values (column 5/1-35) and using the inverse matrix to ascertain the colors of an experimental sample (column 5/58-66). In particular, Kotera teaches that control color prints C1 ... Cn, as shown in figure 2, are imaged, and the measured colors and used to determine the conversion matrix. Kotera teaches that each of these control color prints contain a plurality of "elemental areas," which essentially correspond to sub-areas within the larger print area, and the elemental areas are each "microscopically" imaged to generate representative intensity signals thereof (column 1/59 through column 2/3). The mean intensity value μ of each spectral (i.e. color) component for each control color print corresponds to the representative intensity signal of a per-unit area (column 2/18-27). The set of mean values μ, in conjunction with the set of representative intensity signals, is utilized to obtain the conversion matrix that is used to ascertain the color C_i of a given experimental sample, expressed as the probability $P(C_i)$ that the ascertained color corresponds to the i-th control print (see column 2/22-39 and column 3/57 et seq.).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Marcelpoil by Kotera to measure a plurality of control samples and define the vector

and the matrix on the basis of an average of each color channel present in the control samples, as claimed, since Kotera shows that it was conventional to microscopically scan a control color print on the basis of a plurality of "elemental" sample areas and utilize the average of those sample areas as a basis for deriving a conversion matrix, as explained above. Such a modification would achieve substantially the same results as achieved by Marcelpoil since Marcelpoil's control samples are analyzed in a region where two or three dyes are mixed to produce an area of uniform color.

In addition, Marcelpoil discloses that the microscope may include one or more robotic components (column 18/59-63) but does not appear to disclose an automated loading and unloading member for loading and unloading of a slide, as claimed.

Henderson discloses an automated slide loader for use with a microscope. In particular, Henderson teaches that it is advantageous to provide an apparatus that automatically loads and unloads slides to and from a microscope. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Marcelpoil and Kotera to achieve the claimed invention by including an automatic slide loader/unloader, as claimed, since automating a manual procedure has been judicially recognized as per se obvious. See *In re Venner*, 262 F.2d 91, 95, 120 USPQ 193, 194 (CCPA 1958).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Colin M. LaRose whose telephone number is (571) 272-7423. If

attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta, can be reached on (571) 272-7453. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000. Any inquiry of a general nature or relating to the status of this application or proceeding can also be directed to the TC 2600 Customer Service Office whose telephone number is (571) 272-2600.

Colin M. LaRose
Group Art Unit 2624
22 January 2007